Jurnal Nasional (KUM C No. A2)

Judul Artikel	CitizenApp: Yet Another Social Media Platform For Public Facility Monitoring In Sidoarjo
Penulis	Jagad Yudha Awali, **Irwan Alnarus Kautsar**, Arif Senja Fitrani
Nama Jurnal	JURNAL TEKNOINFO
Volume	16
Nomor	2
Halaman	408-419
ISSN	2615-224X
Penerbit	Universitas Teknokrat Indonesia
Alamat Web Jurnal	https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/article/view/1985
DOI	https://doi.org/10.33365/jti.v16i2.1985
URL Dokumen	http://eprints.umsida.ac.id/9902/
URL Peer Review	http://eprints.umsida.ac.id/9902/6/CA2-PeerReview.pdf
URL Cek Similarity	http://eprints.umsida.ac.id/9902/3/CA2-CekSimilarity-0710221918.pdf
Keterangan	Terindeks Sinta 4: https://sinta.kemdikbud.go.id/journals/profile/420
Tanggal/Waktu/Semester	8 Juli 2022/Genap 2021-2022
Satuan	1 Artikel
Volume	1 Kegiatan
Angka Kredit	3,7

ISSN 2615-224X (online)
ISSN 1693-0010 (print)

JURNAL TEKNOINFO

Jurnal Teknik dan Informatika
Terbit Enam bulanan
(Januari dan Juli)

Vol. 16, No. 2, Juli 2022

Penerbit Universitas Teknokrat Indonesia

Pengelola Program Studi S1 Informatika
Fakultas Teknik dan Ilmu Komputer

SERTIFIKAT

Direktorat Jenderal Penguatan Riset dan Pengembangan,
Kementerian Riset, Teknologi, dan Pendidikan Tinggi

RISTEKDIKTI

Kutipan dari Keputusan Direktur Jenderal Penguatan Riset dan Pengembangan,
Kementerian Riset, Teknologi, dan Pendidikan Tinggi Republik Indonesia
Nomor: 10/E/KPT/2019
Tentang Hasil Akreditasi Jurnal Ilmiah Periode 2 Tahun 2019

Jurnal **TEKNOINFO**

E-ISSN: 2615224X
Penerbit: Universitas Teknokrat Indonesia

Ditetapkan sebagai Jurnal Ilmiah

TERAKREDITASI PERINGKAT 4

Akreditasi berlaku selama 5 (lima) tahun, yaitu
Volume 13 Nomor 1 Tahun 2019 sampai Volume 18 Nomor 2 Tahun 2024

Jakarta, 4 April 2019
Direktur Jenderal Penguatan Riset dan Pengembangan

Dr. Muhammad Dimyati
NIP 195912171984021001

TERAKREDITASI

E-ISSN: 2615-224X
P-ISSN: 1693-0010

JURNAL TEKNOINFO

Jurnal Teknoinfo (Jurnal Teknik Informatika dan Ilmu Komputer) diterbitkan oleh Universitas Teknokrat Indonesia dan dikelola oleh Program Studi S1 Informatika Fakultas Teknik dan Ilmu Komputer. Jurnal ini memiliki P-ISSN 1693-0010 dan E-ISSN 2615-224X. Jurnal Teknoinfo menerbitkan artikel-artikel ilmiah dengan periode enam bulanan yaitu bulan Januari dan Juli. Adapun isi tulisan sepenuhnya menjadi tanggung jawab masing-masing penulis

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E-ISSN: 2615-224X
P-ISSN: 1693-0010

JURNAL TEKNOINFO

Vol. 16, No. 2, Juli 2022

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P-ISSN: 1693-0010

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ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
Available online at https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/index

CITIZENAPP: YET ANOTHER SOCIAL MEDIA PLATFORM FOR PUBLIC FACILITY MONITORING IN SIDOARJO

Jagad Yudha Awali[1)], Irwan Alnarus Kautsar[2)] , Arif Senja Fitrani[3)]

[1, 2,3]Program Studi Informatika, Universitas Muhammadiyah Sidoarjo
[1,2,3]Jl. Raya Gelam No.250, Pagerwaja, Kabupaten Sidoarjo
Email: [1]me@jagad.dev, [2]irwan@umsida.ac.id, [3]asfjim@umsida.ac.id

Abstract

Public facilities are one of the important assets that support citizens' daily activities. Its benefits can be shared by a large number of people in a given region. However, many public facilities found in the Sidoarjo Regency area are not maintained, such as roads, bus stops, trash cans, sidewalks, parks, street lighting, traffic lights, and traffic signs, which can cause discomfort when using public facilities. These conditions could be minimized when local governments involve societies to maintain or monitor them. The objective of this study is to create an integrated smart city mobile application that can be used to report damage to public facilities using the QR Code that has been attached to them. In this study, the waterfall method was used as a development method. The result of this study is a mobile application which is expected to be useful for monitoring public facilities in Sidoarjo. According to the results, the application looks helpful and compatible with all Android devices.

Keyword: Mobile Application, QR Code, Smart City, Public Facilities.

1. INTRODUCING

Technology development is currently moving at a breakneck pace. Various technological innovations appear to make human activities easier in a variety of disciplines, ranging from light to heavy work [1]. Smart cities are one of the technologies that is currently a hot issue all around the world [2]. The reason is that smart cities are a great innovation aimed at advancing a city with the help of information technology that runs on mobile devices [3]. Literally, a smart city can be defined as a city with a concept that is carefully built for the benefit of the citizens who live there, especially in terms of resource management that is more efficient and effective [4][5]. The smart city concept is viewed as a way to use information and communication technology to help individuals, businesses, and governments meet their needs [6].

Sidoarjo is one of the regencies in East Java Province, Indonesia. This city is adjacent to the city of Surabaya [7], so this city is also affected by the flow of urbanization [8]. The problem caused by the increasing flow of urbanization is that the frequent use of public facilities could cause disruptions [9]. In Sidoarjo itself, there is still no smart city application. Many activities, such as reporting damaged public facilities, are still done manually. Many public facilities found in the Sidoarjo Regency area are not maintained, such as roads, bus stops, trash cans, sidewalks, parks, street lighting, traffic lights, and traffic signs, which can cause discomfort when using public facilities. The problem is that the citizens of Sidoarjo have no idea how to report damaged public facilities. Instead, they prefer to ignore them. Another problem is that the government has difficulty collecting data on all city problems in Sidoarjo. The government takes a long time if it wants to record all the city problems that exist in Sidoarjo, so it is necessary for the government to be able to use the citizens to obtain information related to damage to public facilities.

The solution offered to overcome this problem is an integrated and mobile smart city application called CitizenApp, which is intended as a platform for citizens to report damage to public facilities in Sidoarjo, so that the government can easily record damage to public facilities and repair them quickly. CitizenApp works by having the user scan the QR code found on every public facility in Sidoarjo, then uploading a photo and description of the damage. Damage to public facilities that has been reported will be reviewed and will be repaired.

Research related to the facility damage reporting system is "Implementation of Rapid Application Development in the Development of Road Damage Reporting Applications" by Suyanto and Andri, which implements a road damage reporting system with citizens as reporters and admins as the government to take action [10]. In addition, another research is "Web-Based Applications for Reporting Damage to Facilities At Stations and In Trains" by Sanubari et al., which implements a facility damage reporting system at stations to assist officers in managing reports of rail service users on

JURNAL TEKNOINFO
Volume 16, Nomor 2, Juni 2022, Page 408-419
ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
Available online at https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/index

the condition of existing infrastructure [11]. The comparison of this research with the previous one is based on the system that was built, where damage reporting applications in the previous research are generally oriented towards government or institute bodies whose data is not open to the public. CitizenApp carries the opposite concept, which is more user-oriented and designed to look like a social media platform, so that damaged facilities that are shared are visible to the public.

In this study, the waterfall method was used as a development method, which includes needs analysis, design, implementation, testing, and maintenance. The system was developed with the React Native framework as a solution to cut development time and utilize the QR Code feature to make it easier for citizens to report public facilities. This system is expected to make it easier for the citizens and the government to obtain information related to damage to public facilities in Sidoarjo.

2. RESEARCH METHODS

The waterfall model is the most widely used model for the development stage [12]. The waterfall method was used to build the CitizenApp. The waterfall model is referred to the traditional model beginning with requirements analysis, design, implementation, testing, and maintenance [13]. The method phases to build a CitizenApp are shown in Figure 1.

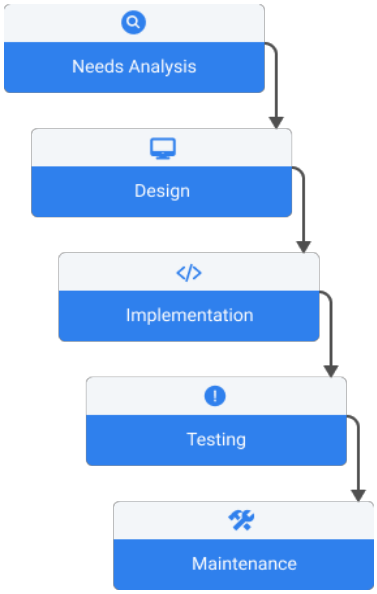

Figure 1. Waterfall Method.

2.1 Need Analysis

Needs analysis is a stage in which current problems are analyzed by looking at public facilities in Sidoarjo directly in order to define the features of the information system required to solve existing problems. The specifications for the needs of the CitizenApp application are as follows:

a. CitizenApp comes with Bahasa since Bahasa is spoken by the majority of Sidoarjo citizens more frequently than other languages.
b. A QR code scanning feature is required to make it easier for the citizens of Sidoarjo to report, so they don't have to fill out as many forms because the QR code saves facility data such as name, category, and coordinates.
c. The user must fill out a form to report public facilities manually, but the coordinate problem can be handled by turning on the GPS to identify geolocation.
d. Users do not need to register an account because Google authentication is used for authentication
e. Users can submit reports in order to earn badges and become the best reporter.

JURNAL TEKNOINFO
Volume 16, Nomor 2, Juni 2022, Page 408-419
ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
Available online at https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/index

2.2 Design

Design is the stage in which we provide a complete picture of what needs to be done and how we want the system to look. Flowcharts, use case, and entity relational databases are used in the design stages.

a. Flowchart is a collection of notation diagram symbols to show the sequence of operations and data flow in the system. This flowchart can represent graphics on the system in terms of physical relationships between entities [14]. Based on flowchart in Figure 2, when the user opens the application, it will immediately display a splash screen. It will then take you to the login screen. The user can input his email and password on the login screen. The user will be unable to login if the data entered by the user is wrong. The main page will appear after the user has successfully logged in. Users can produce reports using the QR-code feature on the main page.

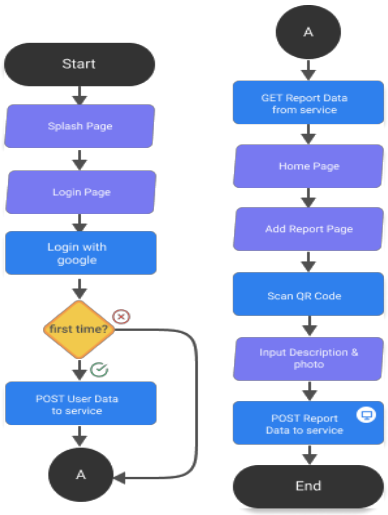

Figure 2. Flowchart.

b. Use case diagrams depict the relationship between one or more actors in the system. It's important to understand that use cases and use case diagrams are not the same thing. This diagram is used as a grouping of several use cases that have been described previously, and is useful in compiling the requirements of a system and communicating the design with customers [15]. Based on use case diagram in Figure 3, damage to public facilities can be reported by users. Users can also make changes and delete reports that have already been published. After a user submits a report, the admin will check to see if it is valid. If the report is invalid, the administrator can change or delete it.

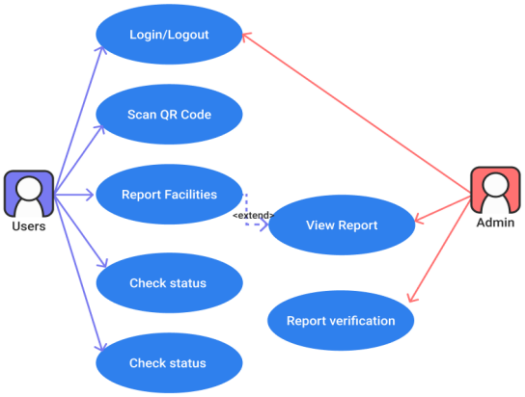

Figure 3. Use Case Diagram

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Volume 16, Nomor 2, Juni 2022, Page 408-419
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c. The database design is described in the entity relationship diagram. Based data database design in figure 4, there are seven entities, including users, badge_list, badge, report, category, facility, and admin. It can be seen that the most important entity is the report, because it is almost related to all the existing entities.

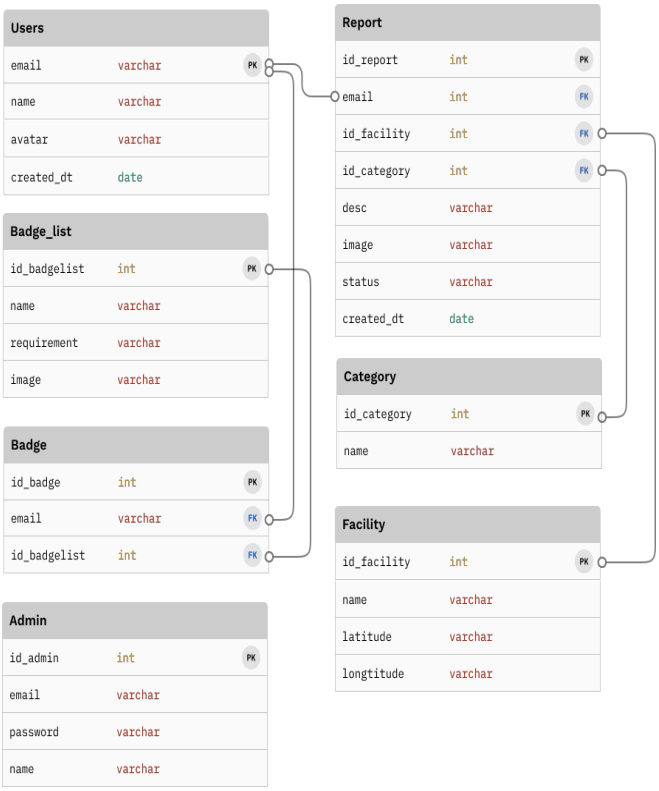

Figure 4. Database Design

2.3 Implementation

Implementation is the process of turning the design's results into a real-world application that the citizens of Sidoarjo may access. React Native will be used as a framework in combination with the JavaScript programming language to create CitizenApp. React Native is a framework designed by Facebook to make mobile app development easier. It allows developers to create native apps for Android and iOS using only one programming language, JavaScript. [16].

2.4 Testing

Testing is a stage in the development process that determines whether or not the final application will perform as planned. Blackbox testing and compatibility testing are used at this stage. Black-box testing is a software testing method that focuses on the software's functional requirements. The goal is to ensure that if there is a mistake in the input data on any part of the application system, the error message is displayed correctly [17].

2.5 Maintenance

The waterfall method's last stage is maintenance. Software that passes the evaluation will immediately begin system maintenance [18] by repeating the development process from the beginning in order to improve current software.

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3. RESULT AND DISCUSSIONS

3.1 Result of CitizenApp Development

The result of application screens that have been developed are listed below:

a. The splash screen is the initial page that appears when the application is launched. The splash screen display can be seen in Figure 5.

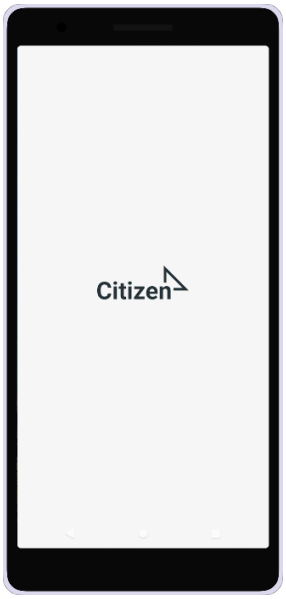

Figure 5. Splash Screen

b. A login page will display after the splash screen. As explained in the needs analysis, Google authentication is used to make it easier for users to log in. The login screen display can be seen in Figure 6.

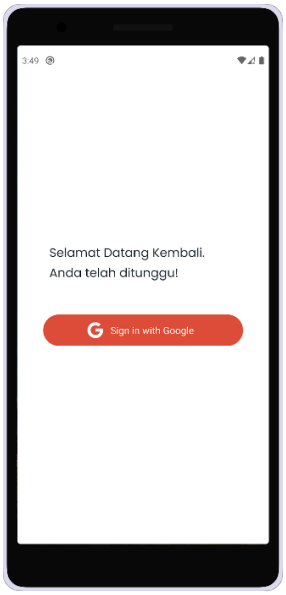

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Figure 6. Login Screen

c. After logging in, a user is directed to the home screen. There are two sections on the home page: information section and recent report section. The home screen display can be seen in Figure 7.

Figure 7. Home Screen

d. Users can scan QR codes that are spread throughout Sidoarjo public facilities. If the facility does not have a QR code, the user can manually report it with gps turned on. The QR Code screen display can be seen in Figure 8.

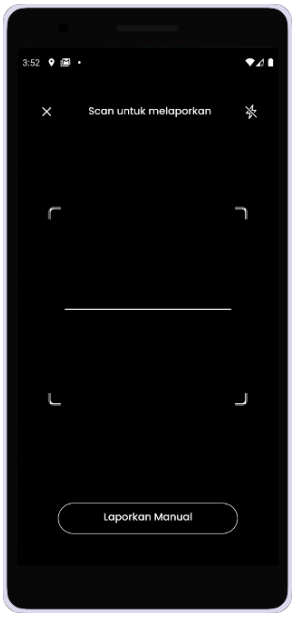

Figure 8. QR Code Screen

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e. There is a form related to the facility to be reported on the add a report screen. The form is automatically filled up when you use the QR code feature. The add report screen display can be seen in Figure 9.

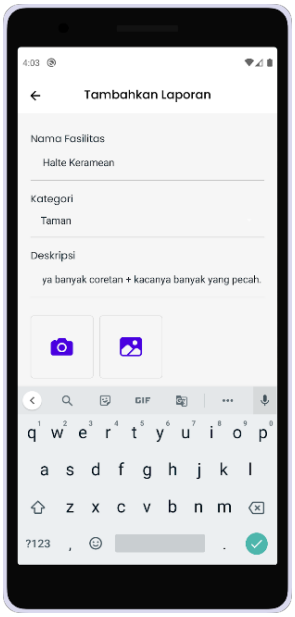

Figure 9. Add Report Screen

f. The explore screen is a collection of all user reports that can be viewed by other users. so that the citizenApp looks like a social media platform. The add explore screen display can be seen in Figure 10.

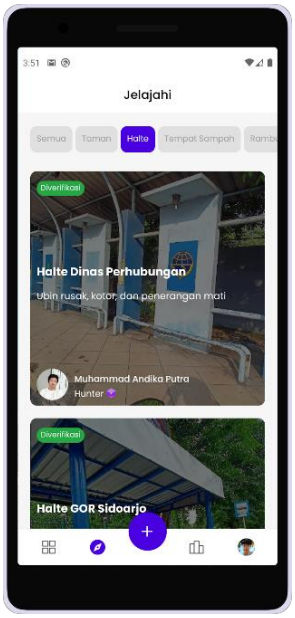

Figure 10. Explore Screen

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g. The report details screen is a page that shows details of user reports based on Google Maps. The report details screen display can be seen in Figure 11.

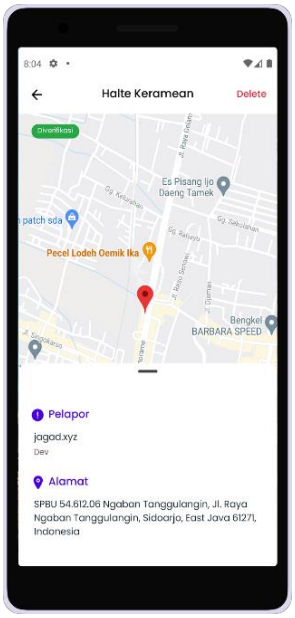

Figure 11. Report Details Screen

h. Leaderboard screen show users based on how many times they've reported. This feature is intended to motivate users to compete for the highest ranking in the leaderboard. The leaderboard screen display can be seen in Figure 12.

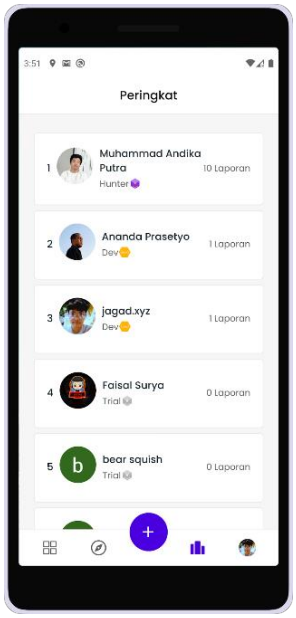

Figure 12. Leaderboard Screen

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i. The profile screen contains information about the user, such as images, names, the number of reports, and badges. The profile screen display can be seen in Figure 13.

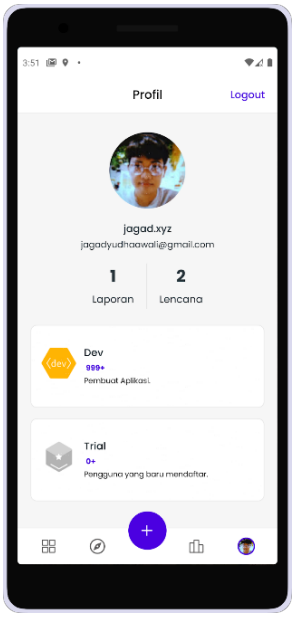

Figure 13. Profile Screen

3.2 Black-Box Testing

Black-box testing is a software testing method that focuses on the software's functional requirements. The process black-box testing of CitizenApp is depicted in Table 1.

Table 1. Black-Box Testing

Testing Scenario	Expected Result	Result
Open the app on phone devices.	The application follows the device's screen.	Pass
Open the app on 7-inch tablet.	The application follows the device's screen.	Pass
Open the app on 10-inch tablet.	The application follows the device's screen.	Pass
Login button is pressed.	Go to the home page.	Pass
Logout button is pressed.	Go to the login page.	Pass
Change reports by category.	Reports change based on the selected category.	Pass

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Scroll down to > 10 reports.	When the scroll has reached 10 reports, the pagination will work	Pass
scan using a valid QR Code.	Redirected to the add report page with the filled-out form.	Pass
scan using invalid QR Code.	Redirected to the add report page, but the form will not be filled in	Pass
Add reports manually with GPS on.	Redirected to the add report page with the app fetching device coordinates.	Pass
Add reports manually with GPS off.	A popup appears with a suggestion to turn on the GPS.	Pass
The report form is completely filled out.	The share button can be pressed.	Pass
The form was not filled out.	The share button can't be pressed.	Pass
Use the app when the internet is off.	redirected to an error page.	Pass

3.3 Compatibility Testing

This test is performed with the goal of determining device compatibility when the program is run on different user devices. Table 2 shows compatibility testing.

Table 2. Compatibility testing

Device Name	Screen Size (inch)	Result
Realme 7	6.5”	Pass
Realme 3	6.22”	Pass
Samsung S21	6.2”	Pass
Redmi Note 8 Pro	6.53”	Pass
Huawei Nova 4	6.40”	Pass
Samsung J2 Prime	5.0”	Pass

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Oppo A5 2020	6.50”	Pass
Xiaomi Redmi 5	5.7”	Pass
Oppo F7	6.23”	Pass
Redmi Note 9 Pro	6.67”	Pass

3.4 Users Feedback

The results were analyzed to see if CitizenApp was effective. An online poll on https://jagad.dev/feedback was used to determine the reliability of this CitizenApp among users. The questions were written on this website and distributed to the respondents via a URL link. The survey included a total of twenty (20) participants.

A total of 3 questions were asked in the questionnaire, including "Does this app have no issues when installed on your devices?", "Do you think this app helps to handle the damaged public facilities?", and "If you are a user, does the QR code system shorten your time to report damaged public facilities?".

For the question "Does this app have no issues when installed on your devices?", 17 of the 20 respondents responded "Very Good" (4), while 3 respondents said "Good" (3). Then, the next question, "Do you think this app helps to handle the damaged public facilities?", 15 of the 20 respondents responded "very helpful" (4), while 5 respondents said "helpful" (3). Then, for the last question, "If you are a user, does the QR code system shorten your time to report damaged public facilities?", 19 of the 20 respondents responded "very helpful" (4), while 1 respondent said "helpful" (3).

Based on Figure 16, the highest percentage is 85% that represents "very good & very helpful" and the other is 15% which indicates "good & helpful". It can be concluded that CitizenApp helps citizens of Sidoarjo to report damage to public facilities.

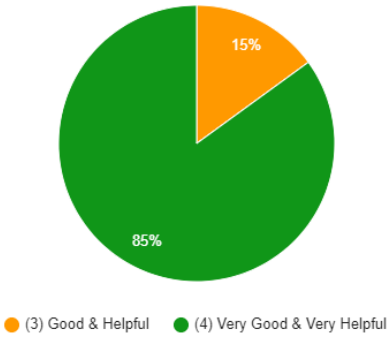

Figure 16. Users Feedback

4. CONCLUSION

Based on the results and discussion described in the previous chapter, it can be concluded that the CitizenApp application has been successfully developed and released on the Play Store to help monitor the feasibility of public facilities in Sidoarjo, so that the government can easily collect information about damage to public facilities in Sidoarjo. System development uses the waterfall method, including needs analysis, design, implementation, testing and maintenance.The CitizenApp application is tested using black box testing and compatibility testing shows that the application is compatible with all Android devices.

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E-ISSN: 2615-224X
P-ISSN: 1693-0010

ALAMAT REDAKSI:

Jl. Zainal Abidin Pagaralam, No.9-11, Labuhanratu, Bandarlampung

Paper#2-CA2-Jurnal Nasional-TEKNO

by Irwan Kautsar

Submission date: 17-Oct-2022 07:18PM (UTC+0700)
Submission ID: 1927619461
File name: Paper_2-CA2-Jurnal_Nasional-TEKNO.pdf (2.87M)
Word count: 3660
Character count: 19063

JURNAL TEKNOINFO
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ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
Available online at https://ejurnal.teknokrat.ac.id/index.php/teknoinfo/index

CITIZENAPP: YET ANOTHER SOCIAL MEDIA PLATFORM FOR PUBLIC FACILITY MONITORING IN SIDOARJO

Jagad Yudha Awali[1)], Irwan Alnarus Kautsar[2)] , Arif Senja Fitrani[3)]

[1, 2,3]Program Studi Informatika, Universitas Muhammadiyah Sidoarjo
[1,2,3]Jl. Raya Gelam No.250, Pagerwaja, Kabupaten Sidoarjo
Email: [1]me@jagad.dev, [2]irwan@umsida.ac.id, [3]asfjim@umsida.ac.id

Abstract

Public facilities are one of the important assets that support citizens' daily activities. Its benefits can be shared by a large number of people in a given region. However, many public facilities found in the Sidoarjo Regency area are not maintained, such as roads, bus stops, trash cans, sidewalks, parks, street lighting, traffic lights, and traffic signs, which can cause discomfort when using public facilities. These conditions could be minimized when local governments involve societies to maintain or monitor them. The objective of this study is to create an integrated smart city mobile application that can be used to report damage to public facilities using the QR Code that has been attached to them. In this study, the waterfall method was used as a development method. The result of this study is a mobile application which is expected to be useful for monitoring public facilities in Sidoarjo. According to the results, the application looks helpful and compatible with all Android devices.

Keyword: Mobile Application, QR Code, Smart City, Public Facilities.

1. INTRODUCING

Technology development is currently moving at a breakneck pace. Various technological innovations appear to make human activities easier in a variety of disciplines, ranging from light to heavy work [1]. Smart cities are one of the technologies that is currently a hot issue all around the world [2]. The reason is that smart cities are a great innovation aimed at advancing a city with the help of information technology that runs on mobile devices [3]. Literally, a smart city can be defined as a city with a concept that is carefully built for the benefit of the citizens who live there, especially in terms of resource management that is more efficient and effective [4][5]. The smart city concept is viewed as a way to use information and communication technology to help individuals, businesses, and governments meet their needs [6].

Sidoarjo is one of the regencies in East Java Province, Indonesia. This city is adjacent to the city of Surabaya [7], so this city is also affected by the flow of urbanization [8]. The problem caused by the increasing flow of urbanization is that the frequent use of public facilities could cause disruptions [9]. In Sidoarjo itself, there is still no smart city application. Many activities, such as reporting damaged public facilities, are still done manually. Many public facilities found in the Sidoarjo Regency area are not maintained, such as roads, bus stops, trash cans, sidewalks, parks, street lighting, traffic lights, and traffic signs, which can cause discomfort when using public facilities. The problem is that the citizens of Sidoarjo have no idea how to report damaged public facilities. Instead, they prefer to ignore them. Another problem is that the government has difficulty collecting data on all city problems in Sidoarjo. The government takes a long time if it wants to record all the city problems that exist in Sidoarjo, so it is necessary for the government to be able to use the citizens to obtain information related to damage to public facilities.

The solution offered to overcome this problem is an integrated and mobile smart city application called CitizenApp, which is intended as a platform for citizens to report damage to public facilities in Sidoarjo, so that the government can easily record damage to public facilities and repair them quickly. CitizenApp works by having the user scan the QR code found on every public facility in Sidoarjo, then uploading a photo and description of the damage. Damage to public facilities that has been reported will be reviewed and will be repaired.

Research related to the facility damage reporting system is "Implementation of Rapid Application Development in the Development of Road Damage Reporting Applications" by Suyanto and Andri, which implements a road damage reporting system with citizens as reporters and admins as the government to take action [10]. In addition, another research is "Web-Based Applications for Reporting Damage to Facilities At Stations and In Trains" by Sanubari et al., which implements a facility damage reporting system at stations to assist officers in managing reports of rail service users on

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the condition of existing infrastructure [11]. The comparison of this research with the previous one is based on the system that was built, where damage reporting applications in the previous research are generally oriented towards government or institute bodies whose data is not open to the public. CitizenApp carries the opposite concept, which is more user-oriented and designed to look like a social media platform, so that damaged facilities that are shared are visible to the public.

In this study, the waterfall method was used as a development method, which includes needs analysis, design, implementation, testing, and maintenance. The system was developed with the React Native framework as a solution to cut development time and utilize the QR Code feature to make it easier for citizens to report public facilities. This system is expected to make it easier for the citizens and the government to obtain information related to damage to public facilities in Sidoarjo.

2. RESEARCH METHODS

The waterfall model is the most widely used model for the development stage [12]. The waterfall method was used to build the CitizenApp. The waterfall model is referred to the traditional model beginning with requirements analysis, design, implementation, testing, and maintenance [13]. The method phases to build a CitizenApp are shown in Figure 1.

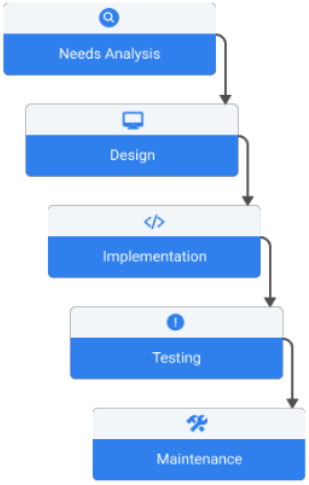

Figure 1. Waterfall Method.

2.1 Need Analysis

Needs analysis is a stage in which current problems are analyzed by looking at public facilities in Sidoarjo directly in order to define the features of the information system required to solve existing problems. The specifications for the needs of the CitizenApp application are as follows:

a. CitizenApp comes with Bahasa since Bahasa is spoken by the majority of Sidoarjo citizens more frequently than other languages.
b. A QR code scanning feature is required to make it easier for the citizens of Sidoarjo to report, so they don't have to fill out as many forms because the QR code saves facility data such as name, category, and coordinates.
c. The user must fill out a form to report public facilities manually, but the coordinate problem can be handled by turning on the GPS to identify geolocation.
d. Users do not need to register an account because Google authentication is used for authentication
e. Users can submit reports in order to earn badges and become the best reporter.

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2.2 Design

Design is the stage in which we provide a complete picture of what needs to be done and how we want the system to look. Flowcharts, use case, and entity relational databases are used in the design stages.

a. Flowchart is a collection of notation diagram symbols to show the sequence of operations and data flow in the system. This flowchart can represent graphics on the system in terms of physical relationships between entities [14]. Based on flowchart in Figure 2, when the user opens the application, it will immediately display a splash screen. It will then take you to the login screen. The user can input his email and password on the login screen. The user will be unable to login if the data entered by the user is wrong. The main page will appear after the user has successfully logged in. Users can produce reports using the QR-code feature on the main page.

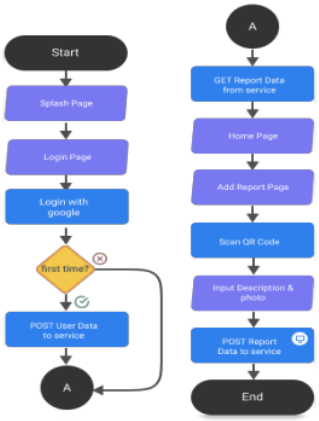

Figure 2. Flowchart.

b. Use case diagrams depict the relationship between one or more actors in the system. It's important to understand that use cases and use case diagrams are not the same thing. This diagram is used as a grouping of several use cases that have been described previously, and is useful in compiling the requirements of a system and communicating the design with customers [15]. Based on use case diagram in Figure 3, damage to public facilities can be reported by users. Users can also make changes and delete reports that have already been published. After a user submits a report, the admin will check to see if it is valid. If the report is invalid, the administrator can change or delete it.

Figure 3. Use Case Diagram

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c. The database design is described in the entity relationship diagram. Based data database design in figure 4, there are seven entities, including users, badge_list, badge, report, category, facility, and admin. It can be seen that the most important entity is the report, because it is almost related to all the existing entities.

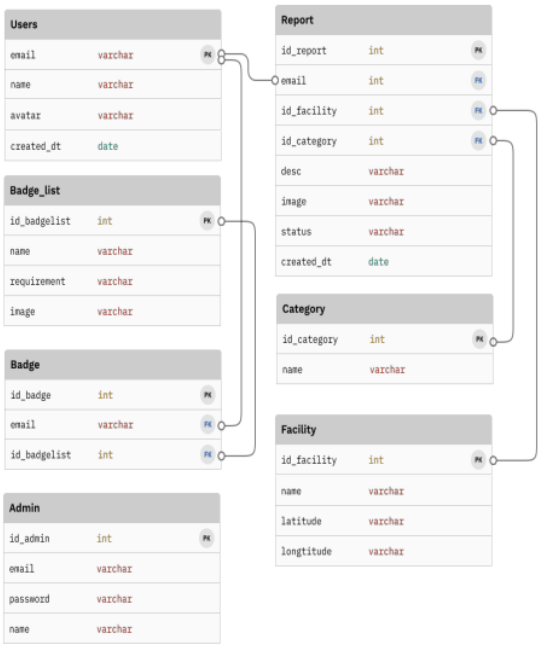

Figure 4. Database Design

2.3 Implementation

Implementation is the process of turning the design's results into a real-world application that the citizens of Sidoarjo may access. React Native will be used as a framework in combination with the JavaScript programming language to create CitizenApp. React Native is a framework designed by Facebook to make mobile app development easier. It allows developers to create native apps for Android and iOS using only one programming language, JavaScript. [16].

2.4 Testing

Testing is a stage in the development process that determines whether or not the final application will perform as planned. Blackbox testing and compatibility testing are used at this stage. Black-box testing is a software testing method that focuses on the software's functional requirements. The goal is to ensure that if there is a mistake in the input data on any part of the application system, the error message is displayed correctly [17].

2.5 Maintenance

The waterfall method's last stage is maintenance. Software that passes the evaluation will immediately begin system maintenance [18] by repeating the development process from the beginning in order to improve current software.

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3. RESULT AND DISCUSSIONS

3.1 Result of CitizenApp Development

The result of application screens that have been developed are listed below:

a. The splash screen is the initial page that appears when the application is launched. The splash screen display can be seen in Figure 5.

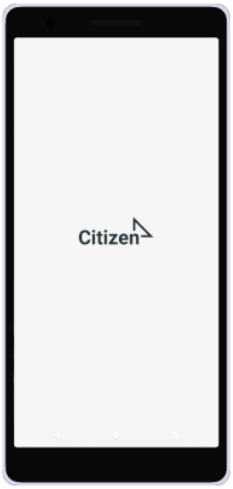

Figure 5. Splash Screen

b. A login page will display after the splash screen. As explained in the needs analysis, Google authentication is used to make it easier for users to log in. The login screen display can be seen in Figure 6.

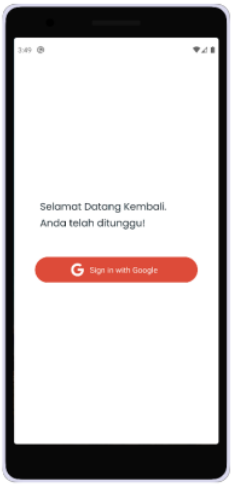

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Figure 6. Login Screen

c. After logging in, a user is directed to the home screen. There are two sections on the home page: information section and recent report section. The home screen display can be seen in Figure 7.

Figure 7. Home Screen

d. Users can scan QR codes that are spread throughout Sidoarjo public facilities. If the facility does not have a QR code, the user can manually report it with gps turned on. The QR Code screen display can be seen in Figure 8.

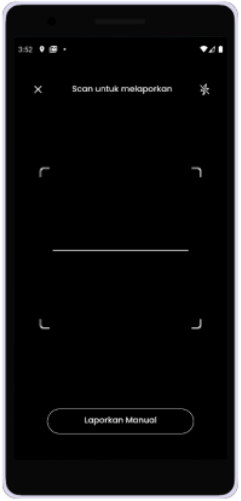

Figure 8. QR Code Screen

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e. There is a form related to the facility to be reported on the add a report screen. The form is automatically filled up when you use the QR code feature. The add report screen display can be seen in Figure 9.

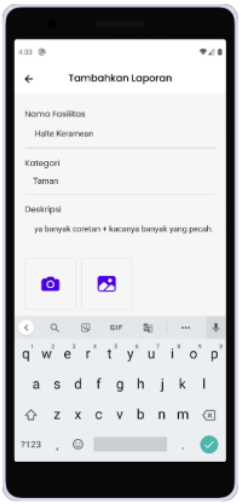

Figure 9. Add Report Screen

f. The explore screen is a collection of all user reports that can be viewed by other users. so that the citizenApp looks like a social media platform. The add explore screen display can be seen in Figure 10.

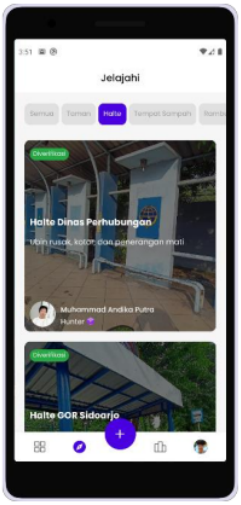

Figure 10. Explore Screen

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ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
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g. The report details screen is a page that shows details of user reports based on Google Maps. The report details screen display can be seen in Figure 11.

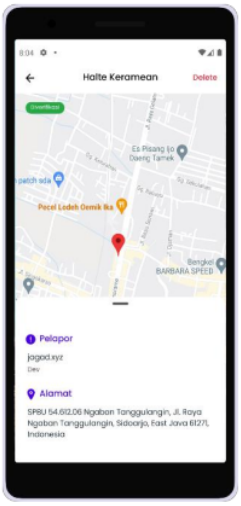

Figure 11. Report Details Screen

h. Leaderboard screen show users based on how many times they've reported. This feature is intended to motivate users to compete for the highest ranking in the leaderboard. The leaderboard screen display can be seen in Figure 12.

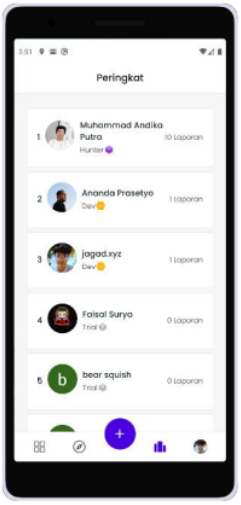

Figure 12. Leaderboard Screen

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ISSN: 1693-0010(Print), ISSN: 2615-224X(Online)
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i. The profile screen contains information about the user, such as images, names, the number of reports, and badges. The profile screen display can be seen in Figure 13.

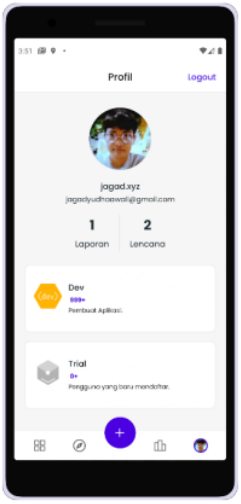

Figure 13. Profile Screen

3.2 Black-Box Testing

Black-box testing is a software testing method that focuses on the software's functional requirements. The process black-box testing of CitizenApp is depicted in Table 1.

Table 1. Black-Box Testing

Testing Scenario	Expected Result	Result
Open the app on phone devices.	The application follows the device's screen.	Pass
Open the app on 7-inch tablet.	The application follows the device's screen.	Pass
Open the app on 10-inch tablet.	The application follows the device's screen.	Pass
Login button is pressed.	Go to the home page.	Pass
Logout button is pressed.	Go to the login page.	Pass
Change reports by category.	Reports change based on the selected category.	Pass

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Scroll down to > 10 reports.	When the scroll has reached 10 reports, the pagination will work	Pass
scan using a valid QR Code.	Redirected to the add report page with the filled-out form.	Pass
scan using invalid QR Code.	Redirected to the add report page, but the form will not be filled in	Pass
Add reports manually with GPS on.	Redirected to the add report page with the app fetching device coordinates.	Pass
Add reports manually with GPS off.	A popup appears with a suggestion to turn on the GPS.	Pass
The report form is completely filled out.	The share button can be pressed.	Pass
The form was not filled out.	The share button can't be pressed.	Pass
Use the app when the internet is off.	redirected to an error page.	Pass

3.3 Compatibility Testing

This test is performed with the goal of determining device compatibility when the program is run on different user devices. Table 2 shows compatibility testing.

Table 2. Compatibility testing

Device Name	Screen Size (inch)	Result
Realme 7	6.5”	Pass
Realme 3	6.22”	Pass
Samsung S21	6.2”	Pass
Redmi Note 8 Pro	6.53”	Pass
Huawei Nova 4	6.40”	Pass
Samsung J2 Prime	5.0”	Pass

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Oppo A5 2020	6.50”	Pass
Xiaomi Redmi 5	5.7”	Pass
Oppo F7	6.23”	Pass
Redmi Note 9 Pro	6.67”	Pass

3.4 Users Feedback

The results were analyzed to see if CitizenApp was effective. An online poll on https://jagad.dev/feedback was used to determine the reliability of this CitizenApp among users. The questions were written on this website and distributed to the respondents via a URL link. The survey included a total of twenty (20) participants.

A total of 3 questions were asked in the questionnaire, including "Does this app have no issues when installed on your devices?", "Do you think this app helps to handle the damaged public facilities?", and "If you are a user, does the QR code system shorten your time to report damaged public facilities?".

For the question "Does this app have no issues when installed on your devices?", 17 of the 20 respondents responded "Very Good" (4), while 3 respondents said "Good" (3). Then, the next question, "Do you think this app helps to handle the damaged public facilities?", 15 of the 20 respondents responded "very helpful" (4), while 5 respondents said "helpful" (3). Then, for the last question, "If you are a user, does the QR code system shorten your time to report damaged public facilities?", 19 of the 20 respondents responded "very helpful" (4), while 1 respondent said "helpful" (3).

Based on Figure 16, the highest percentage is 85% that represents "very good & very helpful" and the other is 15% which indicates "good & helpful". It can be concluded that CitizenApp helps citizens of Sidoarjo to report damage to public facilities.

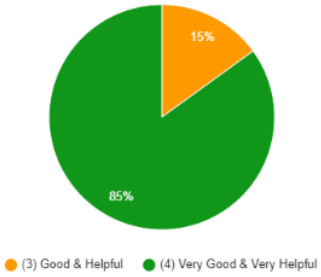

Figure 16. Users Feedback

4. CONCLUSION

Based on the results and discussion described in the previous chapter, it can be concluded that the CitizenApp application has been successfully developed and released on the Play Store to help monitor the feasibility of public facilities in Sidoarjo, so that the government can easily collect information about damage to public facilities in Sidoarjo. System development uses the waterfall method, including needs analysis, design, implementation, testing and maintenance.The CitizenApp application is tested using black box testing and compatibility testing shows that the application is compatible with all Android devices.

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Status Pengusul : **Penulis Kedua**
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